AF/3742

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Inventor(s):	**Dunmin Zheng** **Michael Anthony Zuniga**
Case:	**1-15**
Serial No.:	**09/170835**
Filing Date:	**October 13, 1998**
Examiner:	**J. Harold** Group Art Unit: **3742**
Title:	**Telephonic Handset Employing Feed-Forward Noise Cancellation**

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D. C. 20231

SIR:

Enclosed is Appellants' Brief Under 37 CFR 1.192 in triplicate in the above-identified application.

Please charge the amount of $320.00, covering payment of the fee for the Appeal Brief, to **Lucent Technologies Deposit Account No. 12-23325** as required to correct the error. Triplicate copies of this letter are enclosed.

In the event of any non-payment or improper payment of a required fee, the Commissioner is authorized to charge or credit Deposit Account No. 12-2325 as required to correct the error.

Respectfully,

Martin I. Finston, Attorney
Reg. No. **31613**
908-582-2908

Date: April 3, 2003

Docket Administrator (Room 3J-219)
Lucent Technologies Inc.
101 Crawfords Corner Road
Holmdel, NJ 07733-3030

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 4/3/03 **(Date of Deposit)**
Catherine J. Dugan April 3 2003
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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Inventor(s): **Dunmin Zheng**
Michael Anthony Zuniga

Case: **1-15**

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Filing Date: **October 13, 1998**

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ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D. C. 20231

SIR:

APPELLANTS BRIEF UNDER 37 C.F.R. 1.192

Real Party in Interest

The real party in interest is Lucent Technologies Inc., a corporation of the State of Delaware, having an office at 600 Mountain Avenue, Murray Hill, New Jersey 07974-0636.

Related Appeals and Interferences

No other appeals or interferences known to appellant, appellant's legal representative, or appellant's assignee will directly affect or be directly affected by or have a bearing on the Board's decision in the instant appeal.

Status of Claims

Claim 1 is rejected.
Claim 2 is rejected.
Claim 3 is rejected.
Claim 4 is rejected.
Claim 5 is rejected.

Claim 6 is rejected.
Claim 7 is rejected.
Claim 8 is rejected.
Claim 9 is rejected.
Claim 10 is rejected.
Claim 11 is rejected.
Claim 12 is rejected.
Claim 13 is rejected.
Claim 14 is rejected.
Claim 15 is rejected.
Claim 16 is rejected.
Claim 17 is rejected.
Claim 18 is rejected.

Status of Amendments

No amendments have been filed subsequent to final rejection.

Summary of the Invention

The invention of claim 1 is a telephonic handset. The handset comprises an active noise reduction (ANR) system which, importantly, is configured as a fixed feed-forward noise-cancellation system. The ANR system, as described in claim 1, comprises a non-adaptive, digital, IIR filter.

The invention of claim 9 is a method of ANR which comprises processing a reference signal in a non-adaptive IIR filter, thereby to provide a cancellation signal, and feeding the cancellation signal forward to a receiver transducing element substantially without feedback from said element.

Issues

A. Whether the invention of independent claims 1 and 9 is obvious over the fixed feed-forward noise-cancelling handset of Kimura (U.S. Patent No. 5,138,664) in view of the adaptive personal active noise system with IIR filter of Saunders (U.S. Patent No. 6,078,672) and the non-adaptive IIR filter system of Chen (U.S. Patent No. 6,256,383).

Grouping of Claims

Claims 1-18 stand or fall together.

Argument

The Examiner has rejected claim 1 of the present application as obvious over Kimura in view of Saunders and Chen.

The Examiner has asserted that the apparatus claims of the present application are related to the method claims as inherent implementations thereof. Accordingly, claim 9 stands rejected on substantially the same grounds as claim 1.

Applicants' arguments will be directed to claim 1. However, the same arguments, *mutatis mutandis*, will also apply to claim 9.

The invention of claim 1 is a telephonic handset. The handset comprises an active noise reduction (ANR) system which, importantly, is configured as a fixed feed-forward noise-cancellation system. The ANR system, as described in claim 1, comprises a non-adaptive, digital, IIR filter.

The Examiner has cited Kimura as disclosing a handset having fixed-forward noise cancellation. The Examiner has correctly recognized that Kimura discloses no use of a digital filter, much less a non-adaptive IIR filter, for noise cancellation.

The Examiner has cited the combination of Saunders and Chen as supplying the feature missing from Kimura; i.e., the non-adaptive IIR filter. More specifically, the Examiner has cited Saunders as disclosing an IIR filter in an adaptive personal active noise system, and has cited Chen as disclosing an IIR filter system which is non-adaptive.

However, Saunders teaches the use of feed-forward noise cancellation only in combination with a feedback system for noise cancellation. Saunders states that this is necessary "for dealing with *inadequacies* of the adaptive feedforward algorithm . . . " [Italics added.] Saunders, column 4, lines 37-41.

The Saunders patent application was filed May 6, 1997. The priority of the Kimura patent application was based on a Japanese patent application filed May 25, 1989. Thus, even though almost eight years of progress in the noise-cancellation field took place between Kimura's and Saunders' patent filings, the Saunders applicants still believed that a feed-forward system alone does not do an adequate job of noise cancellation in a personal device.

In fact, the comment in Saunders about the inadequacy of feed-forward systems was made in reference to adaptive feed-forward noise cancellation. The adequacy of a fixed feed-forward system would be in even greater doubt.

Moreover, the Saunders system is not a handset. Instead, it is principally meant to be attached to an article of headgear, or otherwise to be worn on some part of the user's body. Saunders, column 4, lines 24-34. The positioning of the error microphones and loudspeakers can be adjusted to provide the best noise reduction. Saunders, column 7, lines 1-41. Thus, noise cancellation is abetted by the fact that once their positions have been adjusted, the microphones and loudspeakers are, to a large degree, fixed relative to the user's head. A handset, because it is handheld, does not offer the same degree of assurance that once the microphones and loudspeakers have been positioned, they will remain in their original positions relative to the user's head. Thus, once again, if the adequacy of a feed-forward system is in doubt for a head-based system, or other system meant to be worn, it can only be in still greater doubt for a handset system, which is meant to be held.

For the above reasons, Applicants submit that Saunders does not contain any suggestion that would lead the artisan of ordinary skill to include an IIR filter in the Kimura handset. If Saunders suggested anything at all in that regard, it would be to use an adaptive feedback system in the Kimura handset. Saunders clearly teaches away from using a pure feed-forward system for noise cancellation in a personal device.

The Examiner has cited Chen as disclosing a non-adaptive IIR filter. However, Chen teaches the use of the IIR filter only in combination with an adaptive

FIR filter. Chen, column 2, line 64, to column 3, line 9. Thus, Chen actually teaches away from an ANR system that is purely a fixed feed-forward system.

It should also be noted that the technical field to which Chen pertains is not analogous to the field of the present invention. That is, the subject matter of Chen is an echo canceller in a telephone line. By contrast, the subject matter of the present invention is a handset that actively cancels ambient noise propagated through the atmosphere to the user's ear.

Applicants' claim 1 recites that "the ANR system [of the claimed handset] is configured as a fixed feed-forward noise-cancellation system." Applicants' claim 9 recites that the claimed ANR method comprises "processing the reference signal in a non-adaptive IIR filter, thereby to provide a cancellation signal" and "feeding the cancellation signal forward . . . substantially without feedback from [the receiver transducing] element." Thus, both of these claims are limited to the use of a purely fixed feed-forward ANR system. As explained above, Saunders teaches away from such a system. Therefore, even if, arguendo, Chen disclosed a use of an IIR filter similar to Applicants', there would still be no motivation to combine Saunders and Chen with Kimura to make the invention of Applicants' claim 1 or claim 9.

In fact, Chen is inapposite because it deals with the entirely separate technical problem of cancelling echo in telephone lines.

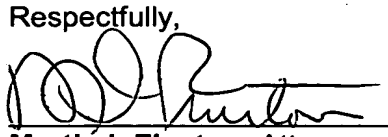
If Chen did have any bearing on the field of Applicants' invention, it would only be to teach away from the claimed invention, since the IIR filter of Chen is only a supplement to an adaptive FIR filter.

For the above reasons, Applicants submit that their independent claims 1 and 9 are both patentable over the cited references under the standard of 35 U.S.C. 103. Applicants submit further that through their dependency from claim 1 or claim 9, all of the other claims in the application are similarly patentable over the cited references.

Conclusion.

Therefore, Applicants respectfully submit that the rejection of claims 1-18 is in error, and respectfully request that these rejections be reversed and the application passed to issue.

Respectfully,



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APPENDIX: THE CURRENTLY PENDING CLAIMS IN THE APPLICATION

1. A telephonic handset comprising an active noise reduction (ANR) system, wherein:

the ANR system comprises a noise reference microphone and a digital filter;

the digital filter is receivingly coupled to the noise reference microphone, and transmittingly coupled to a receiver transducing element in the handset;

the digital filter is a non-adaptive IIR filter; and

the ANR system is configured as a fixed feed-forward noise-cancellation system.

2. The telephonic handset of claim 1, wherein the noise reference microphone has a port, and the port opens through an external surface of the handset that, in use, does not directly face the user's ear.

3. The telephonic handset of claim 2, wherein there is an effective distance between the port of the noise reference microphone and the receiver transducing element, and said distance is no more than 3.8 cm.

4. The telephonic handset of claim 3, wherein the effective distance is no more than 2.5 cm.

5. The telephonic handset of claim 1, wherein:

the ANR system has an operating frequency range;

the receiver transducing element has an approximate transfer function $Y(\omega)$;

when the handset is in use, a transfer function $F(\omega)$ approximately relates ambient acoustic noise pressure n_2 at a user's ear-canal opening to ambient acoustic noise pressure n_1 at the port of the noise reference microphone according to $n_2=F(\omega)n_1$; and

over the operating range, the IIR filter has a transfer function given by the product of a weighting function times $\frac{F(\omega)}{Y(\omega)}$.

6. The telephonic handset of claim 5, wherein the weighting function rolls off above the operating frequency range.

7. The telephonic handset of claim 5, wherein:

$G(\omega)$ is a feasible open loop gain for the ANR system if it is configured as a fixed feedback system instead of a fixed feed-forward system; and

over the operating range, the weighting function is $\frac{G(\omega)}{1+G(\omega)}$.

8. The telephonic handset of claim 5, wherein $F(\omega)$ and $Y(\omega)$ are averaged over a population of representative users.

9. A method of active noise reduction (ANR), comprising:

sampling ambient noise adjacent an external surface of a telephonic handset, thereby to provide a reference signal;

processing the reference signal in a non-adaptive IIR filter, thereby to provide a cancellation signal effective for at least partially canceling ambient noise in the vicinity of the entrance to a user's ear canal; and

feeding the cancellation signal forward to a receiver transducing element substantially without feedback from said element.

10. The method of claim 9, wherein:

the receiver transducing element has an approximate transfer function $Y(\omega)$;

an approximate transfer function $F(\omega)$ relates sampled noise pressure n_2 to ambient noise pressure n_1 in the vicinity of a user's ear canal according to $n_2=F(\omega)n_1$; and

the processing of the reference signal is carried out according to a filter transfer function given by the product of a weighting function times $\frac{F(\omega)}{Y(\omega)}$.

11. The method of claim 10, wherein the weighting function rolls off above the operating frequency range.

12. The method of claim 10, wherein:

$G(\omega)$ is a feasible open-loop gain of a fixed feedback ANR system for the handset; and the weighting function is given by $\frac{G(\omega)}{1+G(\omega)}$.

13. The method of claim 10, wherein $F(\omega)$ and $Y(\omega)$ are averaged over a population of representative users.

14. The method of claim 9, further comprising adjusting the position of the handset relative to the user's ear so as to achieve optimal perceived noise cancellation.

15. The method of claim 9, wherein said sampling is carried out at an external surface of the handset that does not face directly toward the user's ear.

16. The method of claim 15, wherein said sampling is carried out no more than 3.8 cm from the center of the receiver transducing element.

17. The method of claim 16, wherein said sampling is carried out no more than 2.5 cm from the center of said element.

18. The method of claim 15, further comprising adjusting the position of the handset relative to the user's ear so as to achieve optimal perceived noise cancellation.